Project Nautilus: Lowering the Cost of Oceanic Research

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Abstract

Very little money is being spent on research of the ocean. In fact, less than five percent of the Earth's oceans have been explored (Levins, 2009). The purpose of this research project is the open ended development of an autonomous underwater research vehicle for oceanic research and exploration. One prominent method of ocean exploration today is the use of a remotely operated vehicle (ROV) transported out to the ocean by a large research vessel and then released over the side of the vessel and controlled via tether from on board the vessel. Project Nautilus will seek to mimic this method by designing an autonomous surface vessel and a companion autonomous underwater vehicle (AUV).

Introduction

The motivating force behind Project Nautilus is the desire to make oceanic research more readily accessible to smaller research institutions such as universities and private companies. The National Oceanic and Atmospheric Administration (NOAA) receives less money to research the ocean than National Aeronautics and Space Administration (NASA) receives to explore space. It is necessary for the betterment of humanity that a more aggressive policy be taken towards the exploration of the oceans as there is no end to the potential discoveries to be made.

One of the most prominent type of research necessary in the ocean is medical research. In fact, we are 300 to 400 times more likely to make a medical discovery in the ocean than on land (Levins, 2009). In order to promote and enable these discoveries Project Nautilus seeks to allow any interested party to research the ocean for a mere fraction of the cost it would take to research the ocean via traditional methods.

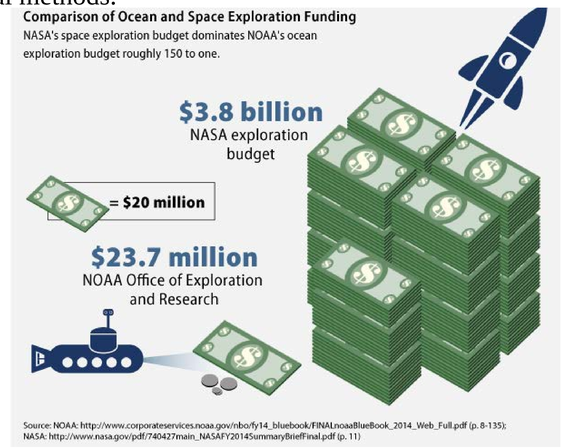

Figure 1: This pictograph shows a comparison between the research and exploration budget of National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA)

How We Differ from Current Technology

Currently, there are only a few long range AUV systems on the market. The most advanced of which are typically gliders which rely on shifting ballast to dive in long arcs and then resurface to transmits data to a land base.

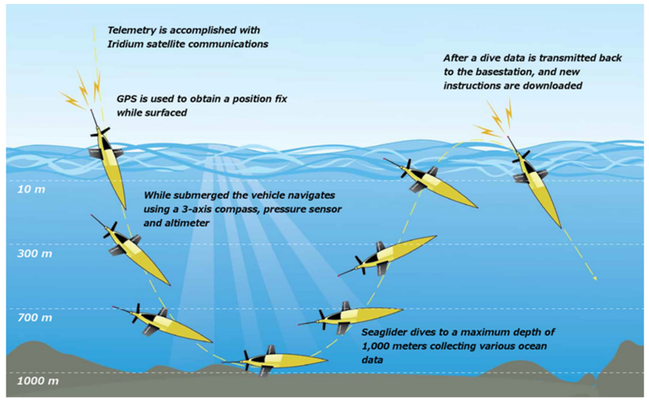

Figure 2: This diagram explains the dive pattern of a glider AUV.
Source: http://systems.fastwave.com.au/ocean-data-acquisition/seaglider

What Gliders Do:

- Survey long thin swaths of the ocean
- Move slowly under very low power
- Transmits data to land base once it surfaces
- Receives new instructions every time it surfaces

What Project Nautilus Will Do:

- Mimic current ROV systems
- Thoroughly explore a designated patch of ocean
- Collect visual data on the environment
- Transmit data to land base upon resurfacing
- Continuously receive instructions stored aboard the surface vessel

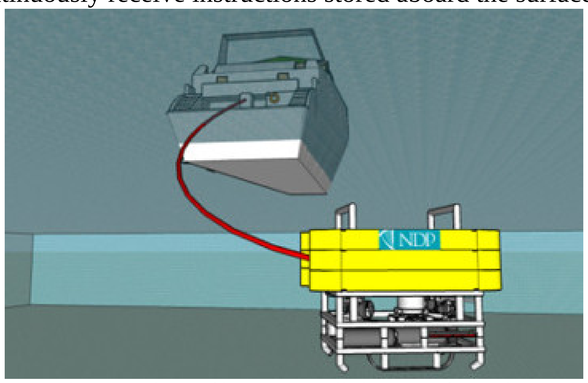

Figure 3: This picture is a depiction of the ROV Latis created by the University of Limmerick
Source: http://www.mmrrc.ul.ie/dotnetnuke/mmrrc/ResearchProjects/ROVLatis.aspx

Progress on the Design

AUV:

- Completed design
- 4 batteries for a 6-8 hour dive time
- Numerous mounting points for modular design
- HDPE frame with added buoyancy foam to create a slightly positively buoyant design
- Multiple lights to allow for high quality visual data acquisition

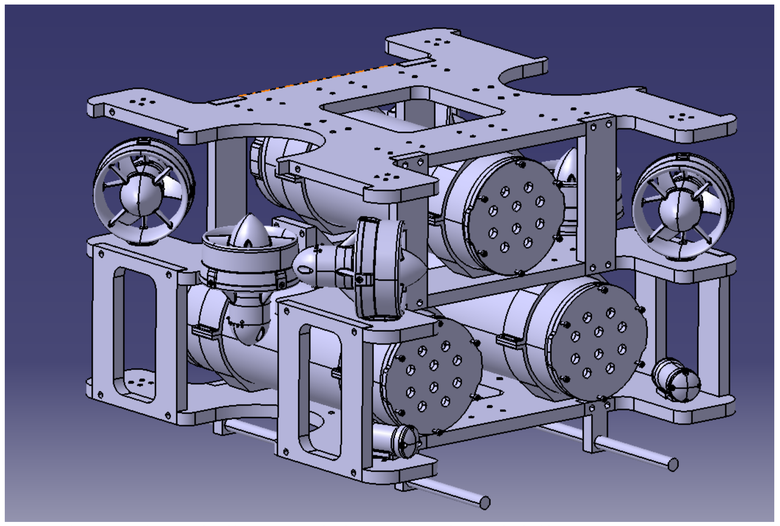

Figure 4: This is a CAD design produced by Project Nautilus depicting the AUV they intend to build.

Surface Vessel:

- Multiple design challenges being faced with regards to power budget
  - Multiple solutions being explored including: solar cells, wind power, and hydrogen cells
  - Docking on rough oceans still being considered
  - Charging on-board the vessel still being considered
- The AUV is the primary concern of the project currently
- Once the AUV construction has been completed all focus will shift to the surface vessel to produce the best possible design

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Contact

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References:

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[2] US Department of Commerce, National Oceanic and Atmospheric Administration. "How Much of the Ocean Have We Explored?" *NOAA's National Ocean Service*, National Oceanic and Atmospheric Administration, 1 Jan. 2009, oceanservice.noaa.gov/facts/exploration.html.+